

Área: ANA

Miniaturized approach using micro-QuEChERS for the determination of 105 pesticides in baby foods

Maria L. S. Trindade (IC),¹ Paula S. Garcia (IC),¹ Sthefanie L. do Valle (IC),¹ Ana C. Paiz (IC),¹ Luciana T. Oliveira (PG),¹ Eric M. Vicente (IC),¹ Gabriel F. Borges (IC),¹ Jean L. O. Arias (PQ),¹ Ednei G. Primel (PQ),¹ Sergiane C. Barbosa (PQ).^{1*}

marialuizasoarestrindade@gmail.com; sergianecaldas@furg.br

¹Laboratório de Análise de Compostos Orgânicos e Metais (LACOM), Escola de Química e Alimentos (EQA), Universidade Federal do Rio Grande (FURG), Campus Carreiros, Avenida Itália s/n km 8, CEP 96203-000, Rio Grande, Rio Grande do Sul, Brasil.

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Highlights

A micro-QuEChERS method for pesticides determination in baby foods was proposed; The method is suitable for monitoring of pesticide residues; The method was aligned with green analytical chemistry principles.

Abstract

Pesticides are widely used in agriculture and industry, but the lack of conformity to Good Agricultural Practices (GAP) can lead to environmental and food contamination^[1]. Residues may persist in processed foods, including baby foods, raising health concerns because children are highly vulnerable to pesticide exposure due to neurological, metabolic, immune, and hormonal factors^[2]. In this study, a method for the determination of 105 pesticides using Micro-QuEChERS and Liquid Chromatography tandem Mass Spectrometry (LC-MS/MS) was proposed. Micro-QuEChERS was selected due to its simplicity, low reagent consumption and reduced waste generation. Separation was carried out using a Kinetex C18 column under gradient elution, with a total time of analysis of 16 min^[3]. For the evaluation of the best extraction conditions, a commercial baby food of banana, blueberry, and quinoa flavor was used, since the presence of macronutrients may cause interferences, affecting extraction efficiency. Acetate and citrate variants of QuEChERS were evaluated^[4], and the acetate-based method showed a higher number of compounds with recoveries (70–120%), relative standard deviations (<20%), and matrix effects (80–120%) in compliance with INMETRO (2020) guidelines^[5]. Different clean-up sorbents (PSA, C18, reused C18, and alumina) were evaluated, and reused C18 was selected due to efficient performance (R% 63 to 119%), lower cost, and environmental advantages. The final optimized method for micro-QuEChERS acetate was validated for accuracy, precision (repeatability and intermediate precision), limits of detection and quantification, linearity, and ruggedness (across different baby food matrices, including mango and apple puree). All results meet the validation guidelines requirements. The results highlight the applicability of micro-QuEChERS acetate combined with LC-MS/MS as a sustainable and reliable method for pesticide monitoring in baby foods.

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